Discussion paper

HOW DOES PERSONAL BANKRUPTCY LAW AFFECT START-UPS?

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How does personal bankruptcy law affect start-ups?

Abstract

We analyze the effect of changes in U.S. state personal exemptions on the financing structure and performance of a representative sample of start-ups. An increase in the amount of borrower's personal wealth protected in bankruptcy reduces the availability of bank credit to all start-ups. Owners of unlimited liability businesses, who benefit from the increase in wealth insurance, offset the reduction in bank credit by investing more money in the firm. We find no such response for start-ups whose entrepreneurs' personal wealth is already protected by limited liability. Consequently, corporations experience lower growth rates and higher failure rates, while proprietorships performance is not negatively affected.

Keywords: Debtor protection, bankruptcy, start-ups, credit availability, agency problems.

JEL Classification: G32, G33, K35, M13

I. Introduction

Start-ups are important drivers of competition, innovation, and job creation. The fraction of employment accounted for by U.S. startups over the 1980-2005 period is about 3 percent per year. While this seems a small fraction of overall employment, it is large compared to the average annual net employment growth for the same period in U.S. (about 1.8 percent). These figures imply that, on average, U.S. net employment growth rates would have been negative if one excluded the new jobs created by start-ups.[1]

Despite their economic importance, start-ups are fragile business ventures that experience high rates of failure during their first years of operation. Economic theory has long rationalized entrepreneurial failure as an inevitable consequence of Schumpeterian creative destruction. However, start-ups are also known to be particularly vulnerable to external factors that are well beyond the risky nature of entrepreneurship. One such factor that is central to virtually all discussions of entrepreneurship is access to credit. If external financing is easily available, start-ups can better tap investment opportunities, challenge competitors, and face temporary liquidity needs, such as those to survive a recession.

In this paper, we show that a higher level of debtor protection provided by U.S. personal bankruptcy law reduces the availability of financing to start-ups. Moreover, we show that through the financing channel, higher debtor protection reduces these start-ups' growth rates and survival chances. We obtain these findings exploiting the passage of state laws that increased the amount of borrower's personal wealth protected in bankruptcy, during the period 2004-2008. The dataset used is the Kaufman Firm Survey (KFS), a longitudinal survey that collects information for a sample of 4,928 start-ups that began operations in 2004 in the United States. Since the KFS tracks start-ups through time, we use within-firm variation in financing structure and performance, allowing us to rule out unobserved firm

[1] Haltiwanger, Jarmin, and Miranda (2009).

heterogeneity concerns. Moreover, since the degree of protection provided by the law depends on the extent of the liability of the firm owner, we assess differential effects of the law according to the legal form of the firm. This allows us to address endogeneity concerns regarding the passage of the laws.

Specifically, our study uses the passage of state laws that increased personal bankruptcy exemptions. In the U.S., most debtors file for personal bankruptcy under Chapter 7. In this case, they must turn over any unsecured assets they own above a predetermined exemption level, while their future earnings are completely exempt from the obligation to repay. A higher exemption level provides partial wealth insurance to debtors, because it reduces the asset value that creditors can seize in bankruptcy. Previous research shows that banks anticipate moral hazard and opportunistic behavior from borrowers by reducing credit availability to households (Gropp et al., 1997).

While personal bankruptcy law is designed for consumers, it also affects unlimited liability firms (proprietorships), since there is no legal distinction between a proprietorship and its owner. In contrast, personal bankruptcy law does not apply to limited liability firms (corporations). Therefore, one would expect higher bankruptcy exemptions to have stronger effects on proprietorships than on corporations.

Our paper provides two novel results that greatly challenge these views. First, we uncover a new channel through which exemptions affect limited liability start-ups. In our U.S. representative sample, a large fraction of corporation owners report that they use personal bank loans to finance their firms' operations. We find that laws that raise exemptions reduce the volume of personal bank loans corporation owners obtain to finance the firm. Consistent with the view that access to credit is a key determinant of firm growth and survival (Holtz-Eakin et al, 1994), we find that these laws decrease the growth rates of corporations, as well as their survival rates.

Second, we show that increases in exemptions do not harm – if anything, they improve – the performance of proprietorships. This is a surprising finding, since our evidence suggests that proprietorships also face a reduction in credit supply. However, we also find that proprietorship owners offset this negative supply effect by investing more personal funds in the firm. By doing so, proprietorship owners are able to maintain their start-ups' financing levels.

We argue that the channel we uncover actually bears a simple economic interpretation. Under unlimited liability, the entrepreneur's personal wealth is exposed to business risks. An increase in exemptions provides additional insurance against these risks. In response to the exogenous increase in wealth insurance, proprietorship owners optimally increase their exposure to firm risk by investing more personal funds in the firm.[2] In contrast, corporation owners do not experience this increase in insurance, since the limited liability form already insures the owner against business losses.

Our study offers an important contribution to the literature. To the best of our knowledge, our paper is the first to investigate how debtor protection affects both the financing structure and performance of start-ups. Our results indicate that a higher level of debtor protection reduces small corporations' access to capital, causing these firms to grow slower and to fail more often. Our study relates to the important strand of literature that shows that creditor rights affect the functioning of credit markets (La Porta et al., 1997; La Porta et al., 1998; Djankov et al., 2003; Djankov et al., 2007; Lerner and Schoar, 2005; Qian and Strahan, 2007; Davydenko and Franks; 2008). Moreover, our study also contributes to the large body of research on the real effects of financing constraints.[3] In particular, we show

[2] Kihlstrom and Laffont (1979) study a model of entrepreneurship in which entrepreneurs differ only on their degree of risk aversion. In equilibrium, the less risk averse individuals become entrepreneurs. Consistent with the view that entrepreneurs are sensitive to their risk exposure, Fan and White (2003), and Armour and Cumming (2008) document that individuals protected by debtor-friendly bankruptcy systems are substantially more likely to be self-employed.

[3] See Stein (2003) for a survey.

that the performance of nascent firms is particularly sensitive to frictions in the credit markets.

Our paper also significantly improves over existing literature that analyzes the effects of bankruptcy exemptions on the methodological front. While previous studies use cross-sectional variation in exemption laws, our paper is the first to exploit the effect of laws that increased the exemption level in the same state.[4] In particular, our identification strategy allows us to address at least two important econometric concerns. First, the panel structure of our data enables us to rule out unobserved heterogeneity across entrepreneurs, firms, and states. This addresses the important concern that high exemption states may attract a different (e.g., less skilled) pool of entrepreneurs. The evidence in Fan and White (2003) corroborates this concern. They find that individuals in high exemption states are substantially more likely to be self-employed (see also Armour and Cumming, 2008). Second, current or expected future economic conditions could have influenced the passage of the exemption laws in the state. To tackle this concern, we exploit differential effects of exemption laws on proprietorships and corporations.

Finally, our results also have important policy implications. First, we document that higher a level of debtor protection inhibits entrepreneurs from acquiring the capital necessary to operate the business. Second, our results confirm that access to capital is an important determinant of start-up growth and survival (Evans and Jovanovic, 1989; Holtz-Eakin et al., 1994). Third, although personal bankruptcy law does not seem to affect directly corporations, our results indicate that it is actually this group of start-ups that are more negatively affected.

[4] Gropp et al. (1997) investigate the effect of state bankruptcy exemptions on the consumer credit market, while Berkowitz and White (2004) and Berger et al. (2011) study the effect of the exemptions on the small business credit market. Finally, Berkowitz, and Hynes (1999) and Lin and White (2001) study whether exemptions affect mortgages.

This is an important finding, because 70% of U.S. firms are organized either as C- or S-corporations and make up 83% of total employment.[5]

The paper is organized as follows. Section II details the institutional background of personal bankruptcy law in the U.S. The dataset and the variables used in our analysis are described in Section III. Section IV develops our hypotheses and presents the empirical strategy. Section V presents the results and Section VI concludes.

II. Institutional background

a. Personal Bankruptcy Law

There are two different personal bankruptcy procedures in the U.S. – Chapter 7 and Chapter 13 – and, during our sample period, debtors were allowed to choose between them. When an individual files for bankruptcy, all collection efforts by creditors terminate. Under Chapter 13, the debtors' wealth is exempted, but they must propose a repayment plan. This plan typically involves using a proportion of the debtor's future earnings over a five-year period to repay debt. Repayment plans must give creditors the same amount they would receive under Chapter 7, but no more.

Under Chapter 7, all of the debtor's future earnings are exempt from the obligation to repay – the "fresh start" principle. Roughly 70% of total bankruptcy filings in the U.S. are under Chapter 7. In a Chapter 7 filing, debtors must turn over any unsecured assets they own *above* a predetermined exemption level (the secured debts cannot be discharged). The "fresh start" is mandated by Federal law, and applies throughout the U.S. In 1978, Congress adopted a uniform federal bankruptcy exemption, but gave the states the right to opt out and

[5] Statistics are derived from the 2008 Statistics of U.S. Businesses (Census Bureau). These figures exclude firms that are non-profit, government owned, or with unspecified organization type. Limited liability firms include C-corporations and S-corporations, while unlimited liability firms include sole proprietorships and partnerships.

to adopt their own exemption levels. By the beginning of the 1980s, two-thirds of the states had opted out. The wealth exemptions vary widely across states as a result.[6]

There are generally two types of exemptions: for equity in owner-occupied residences (the homestead exemption), and for various other types of personal assets (the personal property exemption). Homestead exemptions specify a dollar amount of equity that the debtor is entitled to protect in the event of bankruptcy. Personal property exemptions may apply to assets as diverse as the bible, other books, musical instruments, burial plots, family portraits, clothing, wedding rings, other jewelry, furniture, guns, pets, cattle, crops, motor vehicles, health aids, and food. In many states, however, the law leaves unspecified the value of many of these assets. Our measure of personal property exemptions comprises only assets that have specific dollar amounts in all states: jewelry, motor vehicle, cash and deposits, and a "wildcard" (an exemption that applies to any property).

Table 1 displays the homestead and personal property exemptions by state for 2004 and 2008, which we obtain from individual state legal codes.[7] The homestead exemptions are quantitatively more important than the personal property exemptions for nearly all states. Moreover, the homestead exemptions exhibit greater variation across states, ranging from zero (e.g., Maryland) to unlimited (e.g., Florida and Texas).

b. Changes in state exemptions during 2004-2008

[6] On October 17, 2005, a reform to the U.S. personal Bankruptcy Code – *The Bankruptcy Abuse Prevention and Consumer Protection Act of 2005* – became effective. The objective was to prevent borrowers from abusing the bankruptcy regime by using it to clear debts they could afford to pay. The reform made it more difficult for high-income people to file for Chapter 7 (borrowers are required to pass a means test), but specifically excluded small business owners from the test as long as their debts are mainly business debts.

[7] Some states allow their residents to choose between the state and the federal exemptions. In these cases, we selected the option which grants the claimant with the highest exemption level. In some states, married couples are allowed to double the amount of the exemption when filing for bankruptcy together (called "doubling"). We have doubled all amounts except in those cases where bankruptcy law explicitly prohibits "doubling."

During our sample period, 2004-2008, some states enacted laws that increased substantially their homestead exemption levels. Four states (Minnesota, Montana, Nevada, and Rhode Island) experienced increases larger than $100,000 in their exemption levels, while six states (Delaware, Idaho, New Mexico, New York, South Carolina, and Washington) experienced increases between $50,000 and $100,000. Other states experienced smaller increases in their exemptions levels during the sample period.[8]

We are unaware of any study that investigates the political context behind which these exemption laws were passed. For some states, however, we were able to collect some anecdotal evidence regarding the motivation of the change in law. We obtained the information from comments, reports, and public hearings on the proposed bills. According to the evidence collected, the proposals of an increase in the homestead exemption were backed by three arguments.

The first and main argument is the gap between the homestead exemption value and current house prices. Proponents of the increase in the exemptions levels argued that, since in most states the exemption levels are not updated regularly, sharp increases in house prices and inflation together eroded the homestead's purpose of protecting home ownership. In most cases, the discussion surrounding the approval of the bill focused indeed on the mode of determining a fair homestead value that reflected current house prices. For instance, the bill that increased the homestead exemption in Nevada from $125,000 to $200,000 was promoted by the Southern Nevada Homebuilders Association and the Realtors Association. These lobbyists based their case on the sharp increase in house prices in Las Vegas.[9]

[8] The states with increases above $10,000 (and below $50,000) are: Ohio, Illinois, North Carolina, Indiana, Colorado, Maine, and Nebraska. The states with increases below $10,000 are: New Jersey, Pennsylvania, Hawaii, Michigan, Connecticut, Arkansas, Kentucky, Oregon, and District of Columbia. Most of these small increases below $10,000 simply reflect nominal adjustments.

[9] See comment by Kathia Pereira on the proposed bill at: http://law.unlv.edu/sites/default/files/SB70.pdf.

A second argument often used is that skyrocketing medical expenses increased the need of such protection by medical indebted households.[10] This concern is in line with the evidence in Domowitz and Sartain (1999), who find medical debt to be one of the most important determinants of the consumer bankruptcy decision.

The third argument is that the state's exemption level is much lower than the exemptions offered by the other states. Brinig and Buckley (1996) argue that states use bankruptcy law to compete for "deadbeats," i.e., agents who cross state lines to avoid repayment of debts. These "deadbeats" make desirable immigrants, since they bring to the state assets to protect. For instance, the fact that Nebraska is surrounded by three states that have unlimited homestead exemptions (South Dakota, Iowa, and Kansas) may have contributed decisively to the increase in homestead exemption from $12,500 to $60,000, effective on January of 2007.

Overall, it seems that the main purpose of increasing homestead exemption levels was to restore a reasonable level of insurance to debtors, which had been eroded by increasing house price values and medical costs. It is also important to note that the in the majority of the bills we analyzed, the discussion was overly influenced by a well-identified pressure group with clear private interests. The main promoters of the increase in exemption levels were typically attorneys, law firms, and local bar associations. Hynes et al. (2004) argue that lawyers have strong incentives to lobby in favor of generous debtor protection, as this increases bankruptcy and debt-related litigation. On the opposite side sat representatives of local associations of banks and collectors.

[10] See, for instance, the report on bill HB1805 to raise the homestead exemption in Washington from $40,000 to $100,000, at: http://apps.leg.wa.gov/documents/billdocs/2007-08/Pdf/Bill%20Reports/House/1805.HBR.pdf. See also the transcripts on proposal LB237 to increase the homestead exemption in Nebraska from $12,500 to $60,000, at: http://www.legislature.ne.gov/FloorDocs/100/PDF/Transcripts/Judiciary/2007-01-24.pdf.

III. Data description

This paper uses confidential data from the Kauffman Firm Survey (KFS). The KFS is a longitudinal survey that collected information for a sample of 4,928 start-ups that began operations in 2004 in the United States. In addition to the 2004 baseline year data, we use four years of follow-up data (2005 to 2008). The KFS contains detailed information on the financial capital injections (both debt and equity) these firms receive at their inception and in subsequent years. The survey also provides detailed information on the firm, such as its credit history, geographic location, and industry, and information on up to ten owners, such as experience, education, gender, race, and age.

Table 2 provides definitions of all variables and summary statistics (means and standard deviations) for the 2004 baseline survey and for the subsequent panel years (2005-2008). We report these statistics for the 3,419 firms of the baseline survey that either survived over the 2005-2008 period, or were identified as going out of business over the same period.[11]

We group our variables into five types: firm financing structure, firm size and performance, other firm characteristics, owner characteristics, and state variables. Below, we describe separately the variables in each group.

a. Financing structure

The detailed financing information in the KFS allows us to examine how debtor protection affects the financing structure of start-ups. We focus on the two main sources of financing: debt from financial institutions, and firm owner's funds.

[11] Each year there is some loss in sample size because some firm owners either cannot be located, refuse to respond to the follow-up survey wave, or stop operations. The KFS dataset contains response-adjusted weights that were designed to minimize potential non-response bias in the estimates (see DesRoches et al., 2010, for methodological details in the KFS).

The first source is financing obtained from the firm owners, which includes both equity injections and loans made by the owner. As noted in Robb and Robinson (2010), firm owners supply most of the initial funding for their businesses. In our sample, on average owners' funds represent about 60% of the total financing obtained at inception. Interestingly, the share of this source of funding falls in the following years.

The second source refers to all credit obtained for *business purposes* from financial institutions, including term loans, lines of credit, and credit cards. The KFS further specifies whether these loans are obtained in the owner's name (personal bank financing) or in the firm's name (business bank financing). From a legal standpoint, the distinction between personal bank financing and business bank financing is meaningful only for limited liability firms (corporations). For unlimited liability firms (proprietorships) there is no legal distinction between person and business. Therefore, we classify all bank loans obtained by proprietorships for business purposes as personal bank financing.

In our sample, total bank financing (that includes both personal and business loans) amounts to 29.4% of the total financing at inception. For the average firm, this source of funds at birth is $52,000. Interestingly, as firms grow older, the share of bank financing increases substantially to 55% of all new financing obtained, on average. Moreover, personal bank loans continue to be an important source of financing as firms grow older.

Total financing refers to all financing obtained by the firm, and it includes bank loans, owner financing, and two remaining sources of funding available in the KFS that we do not use in our analysis: other informal sources and other formal sources. Other informal sources refers to financial injections made by non-financial entities that are related to either the firm or the owner, including loans or equity from the owner's family (parents), friends, and employees of the firm. In our sample, for the baseline survey the share of this source of funding is around 7%. The second category, other formal sources, comprises financing

provided by non-financial entities that are independent from both the firm and its owners. These other formal sources include debt and equity injections by other companies, angels, venture capitalists, government, and other business loans. This is the least common source of financing in our sample, amounting on average to only 3% of total financing at birth. However, this is a very important source of financing among those (few) firms who receive it, representing on average 42% of the total financing obtained.

b. Firm size and performance

We use the number of full-time employees and total revenues as two different measures of firm size. These two variables are highly skewed and therefore in our econometric analyses we apply a logarithmic transformation to these variables. We also analyze firm failure, which we measure as the event of firm bankruptcy. About 10% of the firms in operation fail each year, on average.

c. Firm characteristics

The KFS contains the commercial credit score class of the firm from Dun & Bradstreet, which ranges from 1 (minimum risk) to 5 (maximum risk). The credit scores are not available for about one fourth of our sample at birth, though this percentage continuously drops in the following years. The reason for the missing credit scores is that Dun & Bradstreet sometimes did not have enough information to produce a score. To fully exploit the information contained in these credit scores, we decompose the credit score variable into a set of mutually exclusive dummy variables, and make the 'missing credit score dummy' as the omitted category.

We control for the legal form of the firm with a dummy that indicates whether the firm was set up as a proprietorship (i.e., has unlimited liability form, and therefore includes some partnerships), as opposed to a corporation (i.e., has limited liability form, which

includes some partnerships, limited liability companies, and both C- and S- corporations). In our sample, 40% of the firms are set up as proprietorships.

d. Owner characteristics

We include several characteristics of the firm's principal founding owner. For the one third of the firms in our sample with multiple owners, we designate the principal owner by largest equity share. In cases where two or more owners have similar equity shares, we identify the primary owner according to a number of other characteristics, such as the number of hours worked (see Robb and Robinson, 2010, for a detailed description of this methodology).

There is ample evidence that successful entrepreneurship is largely determined by the perseverance, experience, and education of the entrepreneur (see, e.g., Sorensen and Chang, 2006, for a review). Accordingly, we include a variable that measures the number of hours worked weekly, a dummy that equals one if the owner started businesses previously in the same industry, and a categorical variable for the level of education that ranges from one (less than 9th grade) to ten (doctorate). The average entrepreneur in our sample works 41 hours per week. Slightly less than 20% of the entrepreneurs have previous start-up experience in the same industry, and 57% hold at least a college degree.

Finally, we include a dummy indicating whether the owner is from a minority group (black, Asian, or Hispanic), and a dummy indicating whether the owner is female. Thirty-one percent of the owners are female and 15% are from a minority group.[12]

e. State variables

[12] Coleman and Robb (2009) and Robb et al. (2009) document large gender and race differences in the financing patterns of start-ups.

Our main variable of interest is the state exemption value. We obtain the exemption values from individual state legal codes.[13] Table 1 displays the state bankruptcy exemptions in 2004 and 2008. The exemption value is the sum of the homestead exemption and the personal property exemption.

To address the concern that the states can vary systematically along other dimensions, we control for additional state-level characteristics. First, we collect average state house prices from the Federal Housing Finance Agency to control for changing conditions in real estate markets. The inclusion of the average house prices allows us to interpret the homestead exemptions in terms of real amounts of debtor protection offered. Second, we control for differences in economic conditions with the rate of unemployment and with the state median household income, which we obtain from the U.S. Bureau of Labor Statistics and from the U.S. Census Bureau, respectively. Third, from the Business Dynamics Statistics (Census Bureau) we obtain firm entry rates, measured as the percent change in the number of establishments due to births. Higher entry rates could be correlated with fiercer competition, which could negatively affect the performance of start-ups (Kerr and Nanda, 2009).

IV. Hypotheses development and empirical strategy

a. Debtor protection and start-up financing

We analyze two components of start-ups' financing structure that can be affected by a change in exemptions: the owner's own capital injections in the firm, and the amount of personal bank credit (i.e., credit taken in the owner's name, not the firm) to finance the business operations. First, an increase in exemptions represents an exogenous increase in wealth insurance that may induce risk-averse firm owners to inject more of their personal

[13] For details on the different types of exemptions, see subsection II.a.

wealth in the firm. The economic mechanism we have in mind is far from novel. It is a key result emerging from theories of entrepreneurship based on entrepreneurs' risk aversion (Kihlstrom and Laffont, 1979), and it is thought to be the main driver of the empirical regularity that self-employment is more prevalent when the legal environment is debtor-friendly (Armour and Cumming, 2008; Fan and White, 2003).

Moreover, the above effect should be stronger for unlimited liability firms (proprietorships) than for limited liability companies (corporations). The legal form determines the exposure of the entrepreneur's wealth to business risk. While the limited liability form fully insures the entrepreneur's wealth against any business losses, a proprietorship owner is personally liable for the company's debts (i.e., the owner's personal wealth is at stake). As a result, an increase in exemptions reduces the exposure of the proprietorship owner to business risk, while the corporation owner does not experience this direct effect (as the owner's personal wealth was already protected from business failure by the limited liability form).

Second, exemptions may affect how much *personal* credit firm owners obtain from financial institutions. This channel is especially relevant because it seems to affect all start-ups irrespective of the legal form. On the one hand, the unlimited liability of proprietorships implies that all credit obtained by these firms is personal. On the other hand, corporations could also be affected to the extent that their owners use personal credits to finance the firm's operations. In our representative sample, this turns out to be an important channel, as 39% of corporation owners report that they take <u>personal</u> credit to finance business operations.

The net effect of exemptions on *personal* credit depends on the interaction between supply and demand (Gropp et al., 1997). On the supply side, banks could reduce credit availability in response to the moral hazard problems induced by the exemptions (Fay et al., 2002), and the fact that exemptions reduces the asset value creditors can seize in bankruptcy.

On the demand side, the wealth insurance provided by exemptions may induce risk-averse borrowers to increase their demand for personal credit. We note here that, because we focus on loans that are taken at the personal level, we do not expect substantial differences between proprietorships and corporations. In both cases, the borrower is the person, not the firm, and therefore the legal form of the firm should not matter.[14] However, there may be differences in the *magnitudes* of the demand and supply effects, since the wealth insurance provided by the exemptions is stronger for a proprietorship owner than for a corporation owner. As mentioned above, while exemptions insure the proprietorship owner against both personal and business risks, exemptions only insure corporation owners against personal risks. As a result of this stronger wealth insurance, proprietorship owners may for instance increase their demand for credit more than corporation owners in response to an increase in exemptions. We will address this important empirical question in detail in the results section.

b. Identification strategy

To test how exemptions affect start-up financing, we exploit the time-series variation of exemptions during our sample period, 2004-2008.[15] Specifically, the basic panel regression model we estimate is:

[14] We note that the effect of the exemptions on business loans should not be similar. Personal bankruptcy law applies directly to proprietorships, as there is no legal distinction between the firm and the owner. Therefore, an increase in exemptions will imply less credit protection for an unsecured lender to a proprietorship. However, this should not be the case for a small corporation. In this case, the personal wealth of the owner was already protected from business failure by the limited liability form. Therefore, increases in exemptions should not have an impact on the use of business loans by limited liability firms. The empirical evidence is, however, inconsistent with this view. Berkowitz and White (2004), and Berger et al. (2011), document that banks reduce credit availability in high exemption states for both types of firms. These papers argue that the corporations could be indirectly affected by personal bankruptcy law for two reasons. First, high exemptions decrease the value of personal guarantees of firm owners. Second, banks may anticipate that owners of small corporations have greater incentives to transfer assets from the firm to themselves in high exemption states. The latter point may be of particular relevance in the context of nascent firms, where weak governance mechanisms are still likely to predominate. Because the empirical prediction regarding business loans is mixed, we do not include them in our test.

[15] As explained in the previous section, four states experienced increases larger than $100,000 in their exemption levels, six states experienced increases ranging from $50,000 to $100,000, and seven states had changes between $10,000 and $50,000.

$$y_{jst} = \alpha_j + \alpha_t + \beta E_{st} + \delta X_{jst} + u_{jst}, \quad (1)$$

where *j* indexes firms, *s* indexes state of location, *t* indexes time, *y* is the dependent variable of interest, α_j and α_t are firm and year fixed effects, *E* is the exemption level, *X* are control variables, and *u* is an error term. The year dummies control for aggregate fluctuations. The firm fixed effects ensure that we are comparing the same firm before and after the increase in exemptions.

The inclusion of firm fixed effects ameliorates the important concern that the pool of entrepreneurs in high exemption states could be of lower quality than in low exemption states. Fan and White (2003), and Armour and Cumming (2008) document that generous personal bankruptcy systems increase substantially the probability that an individual becomes self-employed. This may result in high exemption states attracting less skilled (marginal) entrepreneurs who ex ante benefit more from the insurance provided by the exemptions. Our methodology fully controls for fixed differences between firms, allowing us to rule out biases driven by unobserved heterogeneity at the state and firm level.

An important feature of the regression model in equation (1) is that it accounts for the fact that we have several exemption laws staggered during our sample period. Consequently, our control group is not restricted to states that never raised exemptions. Equation (1) implicitly takes as the control group all firms located in states not changing exemptions at time *t*, even if they changed exemptions before or will change exemptions later on.

One concern that the above methodology does not address is that current or expected future economic conditions could have influenced the passage of the exemption laws. Hence our findings with equation (1) might be spurious if, for example, worse economic conditions are driving both the increase in exemptions and the changes in the financing structure of start-ups in that state. Although the anecdotal evidence we presented earlier does not hint at such a

link, this seems a reasonable concern because economic conditions can reduce bank lending or the owner willingness to inject capital in the firm.

To tackle this concern we exploit differential effects of the exemptions on the financing structure of proprietorships and corporations. As explained before, the legal form determines the exposure of the entrepreneur's wealth to business risk. In particular, an increase in exemptions reduces the exposure to business risk for proprietorship owners, while not affecting significantly the corporation owner.

Our identification strategy hinges on this asymmetric increase in wealth insurance to business risk that should be experienced mostly by proprietorship owners.[16] Accordingly, we augment our previous regression model by allowing an increase in exemptions to impact differently on the financing structure of proprietorships and corporations:

$$y_{jst} = \alpha_j + \alpha_t + \beta E_{st} + \gamma E_{st} \times UL_j + \delta X_{jst} + u_{jst}, \qquad (2)$$

where UL is a time-invariant dummy that equals one if the firm was set up as an unlimited liability company (proprietorship). The parameter β now measures the effect of the exemptions for a corporation, while γ measures the differential effect between a proprietorship and a corporation. As discussed above, an increase in exemptions could induce proprietorship owners to inject more of their personal wealth in the firm, while the same effect should be weaker for corporations. With respect to funds borrowed at the personal level, the prediction is less clear, because it depends on supply and demand considerations. On the supply side, we expect a strong negative impact affecting all firm owners, since banks may anticipate moral hazard and opportunistic behavior from the borrowers. This would also be consistent with cross-sectional evidence from other papers. On the demand side, we expect a positive effect resulting from the wealth insurance provided

[16] An increase in exemptions also provides wealth insurance to all entrepreneurs against personal risks, such as illness. However, the value of such insurance should not depend on the legal form of the firm, and hence we expect our empirical analysis to "difference out" such effects.

by exemptions. This potential increase in demand should be stronger for proprietorships than for corporations, since only proprietorship owners benefit from an increase in wealth insurance against business risks.

c. Debtor protection, firm growth, and firm survival

An important stream of research shows that the availability of financing affects the growth rate and the probability of survival of start-ups.[17] For instance, if bankruptcy exemptions reduce firm financing, we would expect start-ups in high exemption states to start smaller, to grow slower, and to be more likely to fail. Furthermore, if our conjecture that corporations could face a steeper reduction in financing than proprietorships holds, then corporations should also experience slower growth rates and higher failure rates.

We begin by studying the effect of the increase in exemptions on start-ups' growth rates. To this end, we estimate equations (1) and (2), using as dependent variables the growth rate of the number of employees and the growth rate of revenues.

Next, we use duration analysis to investigate the effect of exemptions on firm failure. We estimate the following basic semi-parametric discrete hazard model:

$$\log h_{jst} = \alpha_t + \beta E_{st} + \delta X_{jst}. \qquad (3)$$

The dependent variable is the logarithm of the hazard rate, i.e., the probability of firm bankruptcy at time *t* given that it survived until *t-1*. The term α_t is the log of the baseline hazard and it captures aggregate variations in failure rates. Each regression coefficient measures the semi-elasticity of the hazard rate with respect to the explanatory variable.

One concern that the above duration model raises is that it mixes cross-section variation in state exemptions with within-state increases in exemptions. To be consistent

[17] For example, Holtz-Eakin et al. (1994) show that firms owned by entrepreneurs who received inheritances suffer a substantial increase in receipts and are more likely to survive. Albuquerque and Hopenhayn (2004) present a dynamic contracting model in which credit constrains cause firms to start smaller and consequently experience lower growth rates and lower survival rates.

with our previous empirical strategy, we need to disentangle the two sources of variation and focus on the latter. We separate the effect on firm survival of the exemption level at the firm's inception from the effect of subsequent increases in the exemptions with the following reparametrization of model (3):

$$log\, h_{jst} = \alpha_t + \beta_0 E_{s0} + \beta_\Delta \Delta E_{st} + \delta_0 X_{js0} + \delta_\Delta \Delta X_{jst}. \qquad (4)$$

In this specification, E_{s0} is the exemption level in state *s* in 2004, while ΔE_{st} is the change in the exemption level between 2004 and current time *t*. Similarly, we breakdown all control variables into their values as of 2004 (X_{js0}) and changes from 2004 to the current period (ΔX_{jst}).[18] As before, we test for the presence of a differential effect for proprietorships and corporations with an interaction term of state exemptions and the legal form at birth. To this end, we augment model (4) accordingly:

$$\log h_{jst} = \alpha_t + \beta_\Delta \Delta E_{st} + \gamma_\Delta \Delta E_{st} \times UL_j + \delta_\Delta \Delta X_{jst} + \boldsymbol{Z_0}, \qquad (5)$$

where $\boldsymbol{Z_0} = \beta_0 E_{s0} + \gamma_0 E_{s0} \times UL_j + \delta_0 X_{js0}$.

To finalize, we note that the existence of a consistent differential effect for proprietorships and corporations across the two empirical analyses (financing and real effects) also provides an important test to our identification strategy.

V. Results

a. Debtor protection and start-up financing

In this section, we use the passage of state laws that increased bankruptcy exemptions during our sample period, 2004-2008, to study the effect of exemptions on start-up financing. We exploit these changes in a panel data model that includes both firm and year fixed effects.

[18] Farinha and Santos (2006), and Geroski et al. (2010), employ similar methodologies to distinguish between the effects of founding conditions and current conditions on start-up survival.

We focus our analysis on two sources of funding: capital injections by the firm owner and personal bank debt incurred by the firm owner for business purposes. In addition, we also analyze total financing. The corresponding dependent variables are the log of the level of personal bank financing, the log of the level of owner's funds, and the log of total financing obtained by the company in that year. We report two specifications in Table 3. In the first specification (columns 1, 3 and 5), the explanatory variable of interest is the level of state exemptions (measured in logs).[19] In the second specification (column 2, 4 and 6), we allow the effect of the exemptions on firm financing to depend on the legal form adopted at birth. To simplify notation, in the tables we label unlimited liability firms (or proprietorships) with "UL" and limited liability firms (or corporations) with "LL". We choose to report separate effects of exemptions for proprietorships and corporations, as well as the estimated differential effect.

Column 1 shows that for the entire sample there is a negative and insignificant effect of the exemptions on firm owners' capital injections. In column 2 we uncover a positive and significant differential effect between the two types of firms that is consistent with our arguments on the wealth insurance effect of Section 4. Specifically, we find that in the case of proprietorships, doubling the exemption level *raises* the inflow of personal funds from the proprietorship owners to the firm by 20%, though the effect is not statistically significant. On the other hand, for corporations, doubling the exemption level *reduces* capital injections by corporation owners by 57%. We find the strong negative effect somewhat surprising, as we were expecting a positive but weaker effect than proprietorships or no effect at all. We will come back to this result and provide a tentative explanation at the end of this section.

We next turn to the results for personal bank financing that we report in columns 3 and 4. Column 3 shows that an increase in exemptions reduces personal bank financing for

[19] We obtain similar results when we use the dollar amount of the exemption level.

all firms, suggesting that, on average, supply effects dominate demand effects. Specifically, our estimates show that doubling the exemption level leads to a 38% decrease in the flow of personal bank financing. This finding corroborates previous findings based on cross-section data for consumer lending (Gropp et al., 1997).

Column 4 shows that the decrease in personal bank financing is entirely driven by the corporations. That is, while corporations suffer a sharp reduction in personal bank financing (i.e., supply effect dominates demand effects), our estimates indicate that proprietorships are able to maintain the same level of personal bank financing. The differential effect between the two groups is both economically and statistically significant. One potential explanation for this result is that, since the exogenous increase in wealth insurance is stronger for proprietorship owners, an increase in exemptions could have a stronger effect on their risk-taking (compared with small corporations). In particular, in the same way that exemptions seem to induce proprietorship owners to inject more of their personal wealth in the firm, they could also induce some proprietorship owners to seek more credit to finance the firm.

It is also true that taken at face value, our results could also be interpreted as lack of evidence that exemptions affect personal bank financing in the case of proprietorship owners. To shed some more light on this issue, we use loan-level data of the KFS, which is available only for the years 2007 and 2008. In these survey years, respondents were asked whether they applied for a loan, and if yes, whether the application was accepted or rejected by the lender. We use these questions to build a proxy for supply (*Denied*) and a proxy for demand (*Applied*) of credit. *Denied* is a binary variable that equals one if the firm applied for credit but was rejected, and zero otherwise, while *Applied* is a binary variable that equals one if the firm applied for credit, and zero otherwise. We estimate probit regressions of *Denied* and *Applied* on all state, firm, and owner characteristics we presented in Table 2. We find a statistically significant negative effect of the exemptions on denial rates for both types of

firms. Moreover, the data clearly rejects a differential effect for proprietorships and corporations. In contrast, we find a significant differential effect in application rates that is consistent with our conjecture that proprietorship owners increase more their demand for credit than corporation owners. Specifically, higher exemptions increase the probability of credit applications more in the case of proprietorships than for corporations and the differential effect is significant at the 10% level.[20] These findings seem to corroborate our interpretation of the financing results we obtained in Table 3. In particular, exemptions indeed seem to have a negative effect on the supply of credit for *all* firms. However on the demand side, exemptions seem to have a stronger positive effect on proprietorship owners. This extra piece of evidence can explain why for this group we do not observe any effect of the exemptions on the equilibrium levels of personal bank financing in Table 3, as the demand effect offsets the supply effect for this group.

Overall, the above results provide strong evidence of a new channel through which small corporations suffer when personal bankruptcy exemptions increase. Because a large percentage of corporation owners borrow at the *personal* level to fund their business operations, and because increases in exemptions strongly reduce credit supply, these firms end up with less access to credit.

The reduction in credit access may also help to explain our previous surprising result that exemptions reduce capital injections by corporation owners. If entrepreneurs are risk-averse and desire to ensure a smooth consumption path, then the permanent reduction in credit access triggered by exemptions increases the opportunity cost of investing personal wealth in the firm. This is because the owner's personal wealth could be alternatively used to face future liquidity shocks (see also Gropp et al., 1997). This effect should dominate in the

[20] To save on space we choose not to report the tables for these results but are available upon request.

case of corporation owners, who do not experience a significant wealth insurance effect, and whose access to credit suffers considerably.

As a corollary to the above results, columns 5 and 6 of table 3 investigate how exemptions affect total firm financing. Besides owner equity and personal bank loans, it contains funds from other "inside" sources (relatives or friends of the firm, employees) and from other "outside" sources (business loans, venture capitalists, angels, other firms, and government). Not surprisingly in light of the previous results, we obtained for the whole sample, total financing decreases when exemptions increase. Also as expected, while the decrease in total financing is very pronounced for corporations, it is not significantly different from zero for proprietorships. The differential effect is positive and significant at the 10% level.

This differential effect corroborates one of our key arguments developed in Section 4. We proposed there that the wealth insurance provided by the exemptions should lead proprietorship owners to invest more personal funds (personal wealth and funds borrowed as personal loans). In contrast, this effect should be weaker for corporation owners, since the limited liability form already insures the entrepreneur's wealth against any business losses.

Concerning the control variables, having a business credit score seems to be a crucial determinant of a firm's ability to obtain financing. Our estimates suggest that a firm with a missing credit score (the omitted category) obtains about the same amount of financing as a firm in the highest risk category. We note that the credit scores matter particularly for business loans – a category of financing we do not analyze separately and that is included in total financing.

Overall, our results provide strong evidence that state laws that increase exemption levels result in a reduction in bank financing available to very young firms. While both proprietorships and corporations seem to experience this decrease in bank lending, our results

show that proprietorship owners compensate for this reduction by investing more personal funds in the company. Next, we investigate whether the exemptions affect firm growth and survival in a fashion consistent with these financing results.

b. Debtor protection, firm growth, and firm survival

We identify the effect of financing constraints on the growth rate and survival using the state laws that increased the exemptions. According to our previous findings, while all firms suffered a decline in bank financing due to higher exemption levels, proprietorship owners offset this effect by investing more personal funds in the company. If these changes in financing structure are indeed been induced by the exemptions, then corporations should also experience slower growth rates and higher failure rates than proprietorships.

We measure firm growth in terms of the number of employees and total revenues. Table 4 shows two specifications for each of these variables. In the first specification (columns 1 and 3), we control only for the level of exemptions (in logs). In the second specification (column 2 and 4), we add the exemption level interacted with a dummy that is equal to one if the firm established as a proprietorship in 2004, and 0 otherwise.

In columns 1 and 2 of table 4 we report the results for the growth rate of the number of employees, while columns 3 and 4 presents the results for revenues growth. We obtain similar qualitative findings for employment and revenues. For the whole sample we find no significant effect of the exemptions on employment (column 1) or on revenues (column 3). However, columns 2 and 4 uncover an interesting asymmetry between proprietorships and corporations. Specifically, proprietorships grow faster when exemptions increase while corporations experience slower growth rates in terms of both employment and revenues. The differential effects between the two types of firms are statistically significant at the 1% level. According to our estimates, the reduction in growth rates for the corporations is substantial.

Specifically, doubling the exemption level decreases their growth rate of employment by 10% and reduces their growth rate of revenues by 28%. For the proprietorships, the results are also economically very meaningful.

So far the results confirm that the exemptions have a strong negative effect on the financing available to corporations, hampering their ability to grow. Our results also seem to corroborate our previous finding that proprietorships do not to suffer a decrease in overall financing. Proprietorships seem to be actually stimulated to expand. We note that this finding could also be a rational response of more risk-taking when the owner is faced with an unexpected increase in wealth insurance. These higher growth rates could simply reflect proprietorship owners' desire to increase their exposure to firm risk by expanding the firm's activities (Kihlstrom and Laffont, 1979).

In table 5 we report the regressions on the effect of debtor protection on the survival of start-ups.[21] We estimate semi-parametric hazard models using data from all survey waves (2004-2008). The dependent variable is the hazard rate, which measures the probability that the firm exits at year *t*, given that it survived until *t-1*.

In order to make our survival analysis consistent with the empirical strategy used previously, we disentangle the two sources of variation in exemptions. In particular, we separate the effect on firm survival of the exemption level at the firm's inception (2004) from the effect of subsequent increases in the exemptions (2005-2008). We note that while the former uses only cross-section differences in exemption levels, we are especially interested in the latter that exploits within-state variation. For this reason and for brevity, we choose to report only the estimates for the variables expressed as yearly changes.

21 We define a failing firm as one that reports to be no longer in business. Some firms drop out of the sample because firm owners either cannot be located or refuse to respond to the survey. These firms are not used in estimation, but the sample weights are adjusted to account for the non-response bias (DesRoches et al., 2010).

In columns 1 and 2, we control for other state level variables (values in 2004 and changes), and firm characteristics (values in 2004 and changes). As before, we report only the estimates for the control variables expressed as yearly changes. In Column 3 and 4 we also add the owner characteristics (values in 2004) to control for the level of human capital.

A change in exemptions within a state does not significantly affect firm survival in the pooled sample (columns 1 and 3). However, we remarkably uncover a differential effect for proprietorships and corporations that is consistent with our previous results. Specifically, states that increased exemptions accelerated the failure rate of the pool of firms that established as corporations when founded and that were still active when the increase in exemptions occurred. Moreover, the economic magnitude of this effect is important: doubling the exemption level increases the annual failure rate of corporations by 27% (column 2). This figure means that starting from a baseline failure rate of 10%, doubling the exemption level increases the failure rate to 12.7%. In contrast, our estimates show that doubling the exemption level decreases the failure rate of proprietorships by 26%. The decrease in failure rate for the proprietorships suggests that these firms were operating below optimal scale (Audretsch and Mahmood, 1994). The increase in exemptions accelerated the growth rate of proprietorships, which perhaps made them reach quicker their minimum efficient scale, and hence experience lower failure rates.

Our survival analysis uncovers other interesting findings among our dynamic control variables. First, states with sharper declines in real estate markets experienced a larger increase in start-up failure rates. Second, states that experienced increasing rates of new firm entry also experienced an increase in failure rates. This suggests that our entry rate variable could be capturing an increase in market competition or churning entry (Kerr and Nanda, 2009). Third, credit ratings are good predictors of firm failure. Firms that experience

improvements in their credit scores experience lower failure rates, while a credit score downgrade or a missing score are good predictors of firm failure.

The estimates we obtain for the owner characteristics (columns 3 and 4) are sensible and in line with previous evidence. Our estimates confirm that human capital is an important determinant of firm survival (Cressy, 1996). Specifically, we find that start-ups founded by more educated owners, owners that have previous experience in the firm's industry, and owners who put more effort in terms of working hours are more likely to survive.

Overall, our findings provide strong evidence that exemptions reduce growth rates and survival for small corporations, while they seem to benefit proprietorships. We think that one important explanation of these results lies in the findings of Section 5a. While corporations experience a reduction in bank credit availability that prevents them from expanding their businesses, the wealth insurance provided by the exemptions to proprietorship owners leads these individuals to compensate for the lack of bank financing by injecting personal funds in the firm and to be less conservative in their expansion policies.

VI. Conclusion

We exploit times series changes in U.S. state exemption levels to analyze the effect of debtor protection on start-ups' financing sources and on their performance. The panel structure of our data allows us to rule out biases driven by unobserved heterogeneity at the state and firm level. Our empirical strategy also exploits the fact that an increase in the exemption level provides a higher level of wealth insurance to proprietorship owners than to owners of small corporations.

We find that an increase in the borrower's personal wealth that is protected from creditors in bankruptcy reduces the inflow of bank financing to proprietorships and small corporations. However, proprietorship owners compensate for the decrease in bank financing by investing more personal funds in the company. We argue that this is a rational response

by risk-averse individuals to the increase in wealth insurance provided by the higher exemption level.

To corroborate our view that these changes in financing structure reflect credit constraints induced by the exemptions, we investigate whether the exemptions affect the growth rate and probability of survival of these start-ups. Consistent with a reduction in available funding for small corporations, we find that an increase in the exemption level reduces their growth rate (measured both, in terms of employees and revenues) and accelerates their failure rate. In contrast, higher exemptions increase the growth rate of proprietorships and improve their survival chances.

Our results indicate that higher levels of debtor protection prevent small corporations from acquiring the capital necessary to operate the business, undermining their ability to grow and survive. We argue that this effect is economically relevant and has important policy implications, since the majority of U.S. firms adopt the limited liability form.

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Table 1 – Bankruptcy exemptions by state in 2004 and 2008

The table displays the dollar amounts of homestead and personal property exemptions for each state in 2004 and 2008. We obtain the exemptions from individual state legal codes. [F] indicates that the Federal exemption was selected and [D] indicates that the exemption was doubled. In some states married couples are allowed to double the amount of the exemptions when filing for bankruptcy together (called "doubling"). We have doubled all amounts except in those cases where bankruptcy law explicitly prohibits "doubling."

State	Exemptions in 2004 ($)		Exemptions in 2008 ($)	
	Homestead	Personal	Homestead	Personal
Alabama [D]	10,000	6,000	10,000	6,000
Alaska	67,500	13,500	70,200	14,040
Arizona	150,000	10,300	150,000	10,300
Arkansas	unlimited	2,900	Unlimited	2,900
California [D]	75,000	16,450	75,000	16,450
Colorado [D]	90,000	8,000	120,000	14,000
Connecticut [D]	150,000	5,000	150,000	9,000
D.C. [F, D]	unlimited	10,300	Unlimited	11,300
Delaware	0	5,000	50,000	40,000
Florida	unlimited	4,000	Unlimited	4,000
Georgia [D]	20,000	9,200	20,000	9,200
Hawaii [F, D]	36,900	12,000	40,400	11,300
Idaho	50,000	9,600	100,000	13,600
Illinois [D]	15,000	6,400	30,000	12,800
Indiana [D]	10,000	0	30,000	16,600
Iowa	unlimited	10,200	Unlimited	20,000
Kansas	unlimited	42,000	Unlimited	42,000
Kentucky [D]	36,900	12,000	40,400	11,300
Louisiana	25,000	15,000	25,000	15,000
Maine [D]	70,000	12,300	95,000	12,300
Maryland	0	22,000	0	22,000
Massachusetts	500,000	2,650	500,000	2,650
Michigan [F, D]	36,900	12,000	40,400	11,300
Minnesota	200,000	4,000	300,000	8,400
Mississippi [D]	150,000	20,000	150,000	20,000
Missouri	15,000	9,500	15,000	9,500
Montana [D]	200,000	14,000	500,000	14,000
Nebraska	12,500	4,800	60,000	4,800
Nevada	200,000	40,000	550,000	42,000
New Hampshire [D]	200,000	16,000	200,000	16,000
New Jersey [F, D]	36,900	12,000	40,400	11,300
New Mexico [D]	60,000	14,000	120,000	14,000
New York [D]	20,000	4,800	100,000	4,800
North Carolina [D]	20,000	4,000	37,000	8,000
North Dakota	80,000	7,400	80,000	7,400
Ohio [D]	10,000	4,400	40,400	12,100
Oklahoma	unlimited	6,000	unlimited	15,000
Oregon [D]	33,000	22,800	39,600	23,700
Pennsylvania [F, D]	36,900	12,000	40,400	11,300
Rhode Island	200,000	22,000	300,000	38,000
South Carolina [F, D]	36,900	12,000	100,000	12,000
South Dakota	unlimited	10,000	unlimited	10,000
Tennessee [D]	7,500	8,000	7,500	8,000
Texas	unlimited	60,000	unlimited	60,000
Utah [D]	40,000	5,000	40,000	5,000
Vermont [D]	150,000	14,800	150,000	14,800
Virginia [D]	10,000	10,000	10,000	10,000
Washington	40,000	11,000	125,000	11,000
West Virginia [D]	50,000	8,400	50,000	8,400
Wisconsin	40,000	14,400	40,000	14,400
Wyoming [D]	20,000	4,800	20,000	4,800

Table 2 – Variable definitions and summary statistics

The dataset is the Kauffman Firm Survey (KFS). The table defines all variables and displays means and standard deviations (S.d.) for the baseline survey (2004) and for the panel years 2005-2008. The omitted credit risk category is missing. The sample contains 3,419 firms that either survived over the 2005-2008 period or were verified as going out of business over the same period. All statistics take into account the KFS sample weights.

Variable	Description	Baseline (2004)		Panel (2005-2008)	
		Mean	S.d.	Mean	S.d.
Financing sources					
Owner equity	Total financing from the firm owner ($000)	52.69	1240.76	13.56	120.44
Bank financing	Total financing from financial institutions ($000)	52.18	365.05	58.64	779.10
Personal bank loans	Total bank financing in the owner's name ($000)	26.98	171.28	23.12	424.59
Total financing	Total firm financing ($000)	139.52	1389.43	153.75	3353.34
Firm size/performance					
Employees	Number of full time employees	1.63	4.89	3.15	8.91
Revenues	Total revenues ($000)	120.62	753.40	505.91	5899.71
Failure rate	% of firms filing for bankruptcy per year			9.90	
Firm characteristics					
Credit risk 1	= 1 if credit score percentile is in the range 91-100; = 0, otherwise	0.00	0.07	0.04	0.19
Credit risk 2	= 1 if credit score percentile is in the range 71-90; = 0, otherwise	0.05	0.22	0.16	0.37
Credit risk 3	= 1 if credit score percentile is in the range 31-70; = 0, otherwise	0.37	0.48	0.48	0.50
Credit risk 4	= 1 if credit score percentile is in the range 11-30; = 0, otherwise	0.30	0.46	0.14	0.35
Credit risk 5	= 1 if credit score percentile is in the range 1-10; = 0, otherwise	0.05	0.21	0.08	0.26
Proprietorship	= 1 if firm is unlimited liability (UL); = 0, if limited liability (LL)	0.40	0.49		
Owner characteristics					
Hours worked	Number of hours worked weekly by the owner	41.55	24.16		
Previous experience	= 1 if owner started other businesses in the same industry; = 0, otherwise	0.16	0.37		
Education	Level of education attained by firm owner: ranges from 1 to 10	6.16	2.08		
Female	= 1 if owner is female; = 0, otherwise	0.32	0.47		
State control variables					
House prices	Average house price ($000)	240.51	117.83	261.49	126.25
Unemployment rate	Rate of unemployment (in %)	5.51	0.84	4.99	1.03
Median income	Median household income ($000)	49.57	6.74	49.57	6.74
Entry rate	% change in the number of establishments due to births	12.01	1.77	11.99	1.87
Minority	= 1 if owner is non-white; = 0, otherwise	0.15	0.36		

Table 3 – Bankruptcy exemptions and firm financing sources

The dependent variables are the yearly inflow of bank financing obtained in the name of the firm owner (columns (1) and (2)), the yearly inflow of financing from the firm owner (columns (3) and (4)), and the yearly inflow of total financing (columns (5) and (6)). All three dependent variables are measured in logs. The omitted credit risk category is missing. The dataset comprises the 2004, 2005, 2006, 2007, and 2008 Kauffman Firm Survey (KFS). The sample contains 3,419 firms and 15,384 firm-year observations. The regressions take into account the KFS longitudinal sample weights. Robust t-statistics are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	Financing sources				Total financing	
	Owner financing		Personal bank loans			
	(1)	(2)	(3)	(4)	(5)	(6)
Exemptions						
Log(Exemptions)	-0.27		-0.38**		-0.41**	
	(-1.37)		(-2.15)		(-2.09)	
Log(Exemptions) × LL		-0.57**		-0.62***		-0.62**
		(-2.09)		(-2.77)		(-2.31)
Log(Exemptions) × UL		0.20		0.00		-0.08
		-0.85		(-0.00)		(-0.33)
Diff. effect (UL – LL)		0.77**		0.62**		0.54*
State controls						
Log(House prices)	1.21	1.19	2.34***	2.33***	0.50	0.49
	(1.37)	(1.35)	(2.71)	(2.70)	(0.55)	(0.53)
Log(Median income)	-2.87**	-2.85**	-0.40	-0.38	-2.02	-2.00
	(-2.08)	(-2.06)	(-0.28)	(-0.27)	(-1.39)	(-1.38)
Unemployment rate	0.22	0.23	0.15	0.16	0.01	0.02
	(1.45)	(1.50)	(1.00)	(1.04)	(0.08)	(0.12)
Entry rate	0.11	0.11	-0.02	-0.02	0.14	0.14
	(0.91)	(0.95)	(-0.19)	(-0.15)	(1.15)	(1.18)
Firm characteristics						
Credit risk 1	0.00	0.03	-0.32	-0.30	1.00***	1.02***
	(0.01)	(0.08)	(0.96)	(0.91)	(2.81)	(2.85)
Credit risk 2	0.47**	0.49**	0.13	0.13	0.92***	0.93***
	(2.35)	(2.41)	(0.62)	(0.67)	(4.48)	(4.53)
Credit risk 3	0.70***	0.71***	0.32**	0.32**	0.93***	0.93***
	(4.38)	(4.40)	(2.12)	(2.13)	(5.69)	(5.70)
Credit risk 4	0.30*	0.30*	0.37**	0.38**	0.38**	0.39**
	(1.66)	(1.68)	(2.15)	(2.17)	(2.05)	(2.07)
Credit risk 5	0.25	0.26	-0.20	-0.19	0.00	0.01
	(1.01)	(1.04)	(0.79)	(0.77)	(0.01)	(0.03)
Constant	21.80	21.60	-19.50	-19.60	24.30	24.20
	(1.16)	(1.15)	(1.01)	(1.02)	(1.23)	(1.23)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	25.4	25.4	2.9	2.9	16.0	16.1

Table 4 – Bankruptcy exemptions and firm growth rate

The dependent variables are the yearly growth rate of full-time employees (columns (1) and (2)), and the growth rate of total revenues (columns (3) and (4)). The omitted credit risk category is missing. The dataset comprises the 2004, 2005, 2006, 2007, and 2008 Kauffman Firm Survey (KFS). The sample in columns (1) and (2) contains 3,415 firms and 14,623 firm-year observations. The sample in columns (3) and (4) contains 3,392 firms and 14,395 firm-year observations. The regressions take into account the KFS longitudinal sample weights. Robust t-statistics are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	Employees		Revenues	
	(1)	(2)	(3)	(4)
Exemptions				
Log(Exemptions)	0.013		-0.023	
	(0.35)		(-0.21)	
Log(Exemptions) × LL		-0.10**		-0.28*
		(-2.12)		(-1.88)
Log(Exemptions) × UL		0.20***		0.40***
		(3.93)		(3.05)
Diff. effect (UL – LL)		0.30***		0.68***
State controls				
Log(House prices)	0.021	0.01	0.40	0.39
	(0.13)	(0.07)	(0.74)	(0.71)
Log(Median income)	0.70**	0.71**	0.51	0.54
	(2.32)	(2.35)	(0.51)	(0.54)
Unemployment rate	0.01	0.01	-0.02	-0.01
	(0.32)	(0.40)	(-0.19)	(-0.1)
Entry rate	-0.01	-0.01	0.03	0.04
	(-0.28)	(-0.22)	(0.39)	(0.43)
Firm characteristics				
Credit risk 1	0.15***	0.16***	0.24	0.26
	(2.73)	(2.88)	(0.93)	(1.01)
Credit risk 2	0.11***	0.12***	0.41***	0.42***
	(2.76)	(2.88)	(2.85)	(2.92)
Credit risk 3	0.12***	0.13***	0.58***	0.58***
	(3.95)	(4.01)	(5.59)	(5.64)
Credit risk 4	0.01	0.01	0.42***	0.42***
	(0.29)	(0.33)	(3.50)	(3.55)
Credit risk 5	-0.17***	-0.17***	0.23	0.24
	(-2.95)	(-2.92)	(1.24)	(1.29)
Constant	-7.25*	-7.28*	-8.59	-8.90
	(-1.80)	(-1.81)	(-0.64)	(-0.66)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R-squared	11.7	11.7	17.9	17.9

Table 5 – Bankruptcy exemptions and firm exit

The table presents estimates of proportional Cox regression models. The coefficients measure the partial impact of each variable on the likelihood the firm goes bankrupt, conditional on duration. The symbol Δ refers to the annual change in the variable. Credit score upgrade (downgrade) equals one if credit score percentile increased (decreased) between t-1 and t. Credit score to missing equals one if the firm had a credit score in t-1 and did not have one in t. Credit score awarded equals one if the firm did not have a credit score in t-1 and had one in t. The model also includes (estimates not shown) the following categories of variables measured as of 2004 (see also Table 2): exemptions, state controls, firm characteristics, and industry dummies. The dataset comprises the 2004, 2005, 2006, 2007, and 2008 Kauffman Firm Survey (KFS). The regressions take into account the KFS longitudinal sample weights. The number of observations is 11,974 in columns (1) and (2), and 11,901 in columns (3) and (4). Robust t-statistics are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	(1)	(2)	(3)	(4)
Exemptions				
Δ Log(Exemptions)	0.08		0.06	
	(0.82)		(0.67)	
Δ Log(Exemptions) × LL		0.27***		0.24***
		(3.04)		(3.05)
Δ Log(Exemptions) × UL		-0.26*		-0.25*
		(-1.75)		(-1.65)
Diff. effect (UL – LL)		0.52***		0.50***
State controls				
Δ Log(House prices)	-0.94**	-0.94**	-1.23***	-1.23**
	(-2.34)	(-2.36)	(-2.80)	(-2.81)
Δ Log(Median income)	0.68	0.70	0.55	0.56
	(0.69)	(0.71)	(0.50)	(0.50)
Δ Unemployment rate	-0.02	-0.03	-0.10	-0.11
	(-0.31)	(-0.46)	(-1.16)	(-1.27)
Δ Entry rate	0.08*	0.07*	0.08	0.07
	(1.77)	(1.67)	(1.47)	(1.39)
Firm characteristics				
Credit score upgrade	-0.27***	-0.28***	-0.28***	-0.29***
	(-2.81)	(-2.89)	(-2.83)	(-2.91)
Credit score downgrade	0.27***	0.26***	0.26**	0.25**
	(2.48)	(2.45)	(2.27)	(2.23)
Credit score to missing	0.61***	0.62***	0.61***	0.62***
	(6.02)	(6.13)	(6.09)	(6.17)
Credit score awarded	-0.18	-0.18	-0.22	-0.22
	(-1.05)	(-1.06)	(-1.19)	(-1.21)
Owner characteristics				
Hours worked			-0.01***	-0.01***
			(-2.81)	(-2.88)
Previous experience			-0.20*	-0.20**
			(-1.90)	(-1.98)
Education			-0.06***	-0.06***
			(-3.44)	(-3.34)
Female			0.12	0.13
			(1.34)	(1.37)
Minority			0.10	0.10
			(1.17)	(1.13)